

Prestress losses = 9%

Concrete compressive strength, f'_c (**girder**) = 53.10 MPa (7,700 psi.)

Concrete unit weight, g_c (**girder**) = 2,425 kg/m³ (151.4 lbs/ft³)

Maximum concrete strain at ultimate moment = 0.003

Based on the *Cracked Beam* analysis, the ultimate moment of the girder was found to be 4,453 kN-m (3,284 ft-kips). Under this moment, yielding occurred in the bottom six layers of prestressing strands, according to the stress-strain curve given in the PCI Handbook (1999) for a Grade 270 strand as shown below:

$$e_{ps} \leq 0.0086 : f_{ps} = E_s e_{ps} \quad (\text{ksi}) \quad (5-1a)$$

$$e_{ps} \geq 0.0086 : f_{ps} = 270 - \frac{0.04}{e_{ps} - 0.007} \quad (\text{ksi}) \quad (5-1b)$$

where e_{ps} = strain in the prestressing strand
 f_{ps} = stress in the prestressing strand (ksi)
 E_s = Modulus of elasticity of prestressing strand (ksi)

So yielding occurred in all the strands within 305 mm (12 in.) from the bottom of the girder. The total tensile as well as compressive force in the girder was equal to 5,747 kN (1,292 kips) under the ultimate moment. Other results for the girder before flexural cracking are shown in Table 5.1. It should be noted that the applied decompression load and the applied cracking load were not obtained directly from the analysis. Instead, they were calculated from the corresponding moments after deducting the dead load moment of the girder due to self-weight.

The *Cracked Beam* analysis also showed that the fatigue service load was 480 kN (108 kips), producing a moment of 2,760 kN-m (2,037 ft.-kips), which is virtually identical to the actual fatigue service load of 476 kN (107 kips) applied during the test.